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TABLES

FOR

SETTING OUT HALF-WIDTHS

ON

RAILWAYS, ROADS, CANALS,

AND OTHER PUBLIC WORKS;

TO BE APPLIED IN FIELD WORK, AND WITHOUT ANY PREVIOUS CALCULATIONS.

By J. S. OLVER, C.E.

AUTHOR OF 'TABLES FOR SETTING-OUT CURVES.'

183. g.

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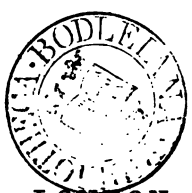

LONDON:
E. & F. N. SPON, 48, CHARING CROSS.
1870.

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LONDON: PRINTED BY W. CLOWES & SONS, STAMFORD STREET AND CHARING CROSS.

PREFACE.

THE following Tables have been calculated with the view to supply a desideratum in the Library of the Civil Engineer.

The practice of Civil Engineers and Surveyors has been hitherto, for the most part, to obtain a section of the sidelong ground at the point where the Half-width is to be measured, upon a right angle to the centre line of railway or work to be constructed, and upon this section afterwards to plot in the office, the depth of cutting or height of embankment, the width of road, and the slopes of work, so as to determine the required Half-widths on the natural surface, and measure the same on the ground when thus obtained; which is a simple and certain, though tedious process. There are also methods of calculating and setting out Half-widths by field work alone, but involving much time and labour.

It is believed, however, that no work in the form of Tables has been hitherto published to afford a ready means of determining on the ground the Half-widths required, and expeditiously setting them out; should therefore the present little work be deemed to be sound in principle, and practically useful in saving time and labour, the object sought for will have been thus accomplished.

J. S. OLVER.

LONDON, *April* 19, 1870.

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ON SETTING OUT HALF-WIDTHS ON RAILWAYS, ROADS, AND OTHER WORKS,

WITH EXPLANATION AND USE OF THE TABLES.

In all cases in the Tables, the Depth of Cutting is the same in meaning as Height of Embankment; and Slope of Cutting and Embankment is the same as Batter of Retaining Wall, in either case respectively.

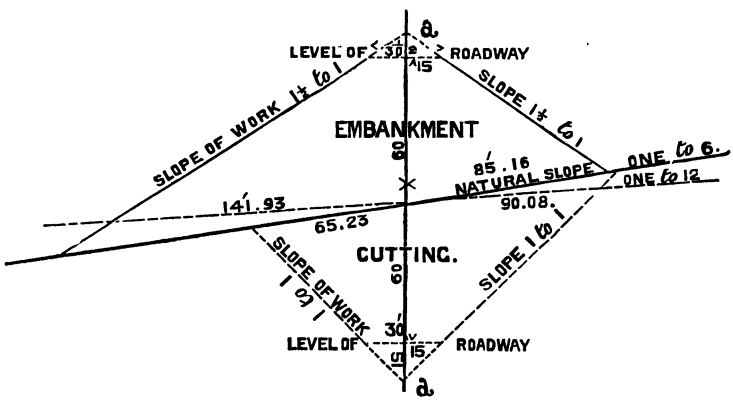
Previously to any step being taken to determine the Half-widths of the railway or works to be constructed, the centre longitudinal line of the same must be set out and chain-pegged throughout; and the longitudinal section will then be made and the depths of cutting and heights of embankment respectively shown at each centre peg. The practice generally has been to determine the Half-widths on each centre peg, but this will depend on the inequalities of the surface of the ground, and whether the widths of work may tend thereby to vary rapidly or not.

At the point on the centre line where the Half-widths are sought to be determined, the levels or inclination of the natural surface, at a right angle thereto, should be measured by a spirit level, or the vertical angle of the same ascertained by a theodolite, sextant, or any more simple instrument adapted for the purpose, say in the first instance, on the higher side (which will be the longer dimension for cutting, and the shorter dimension for embankments), and then on the lower side of the centre peg. The average rise and fall of the natural surface is to be attended to, and carefully noted, both to the right-hand and left-hand side of the centre line; and where it varies much, more than one observation will be necessary to determine the average slope in each case, allowance to be made of course in the Half-width, in addition to the Embankment or Cutting, for drain and fence, these being details which can be determined only by reference to particular localities.

Fig. 1 is a diagram exhibiting the application of the Tables

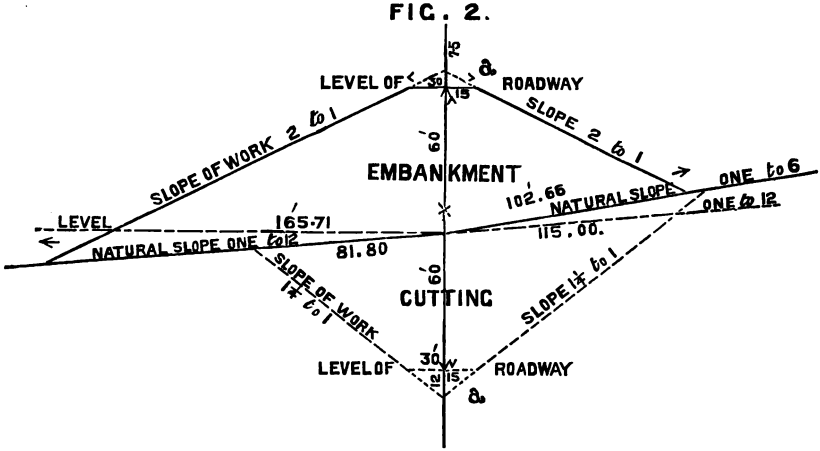
in the instance of an uniform natural slope, where one observation only is required,

FIG. 1.



and Fig. 2 exhibits the same in the instance of an irregular or varying natural slope, in which the observations made from the centre will depend on both sides.

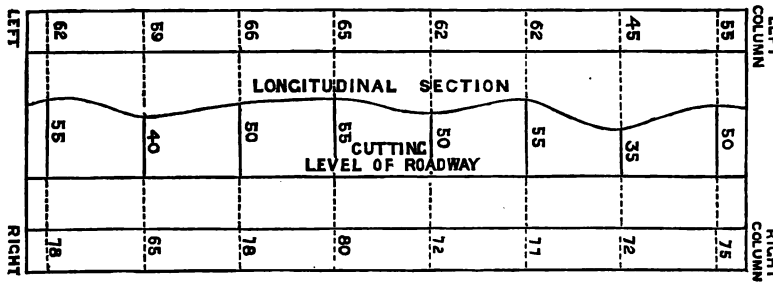
FIG. 2.



Having ascertained the dimension of each width to the right

hand and left hand of the centre as the work proceeds, the same will be entered in columns, arranged for that purpose on the longitudinal section before commencement, as shown in Fig. 3,

FIG. 3



where the middle figures indicate the depths of cutting marked on the section, as previously explained, and the right-hand and left-hand columns serve for inserting the respective Half-widths as may have been determined accordingly.

The Tables are calculated upon a maximum standard, supposing the work to be formed uniformly throughout, upon one width of road of 30 feet, one depth of cutting and height of embankment of 60 feet, but admitting every possible variation of slopes within range of experience; and consequently in almost every instance, in order to apply these Tables to practice, it will be necessary to make some calculations so as to adapt the figures therein found to the circumstances in which it is sought to apply them; and for this purpose it will be necessary to make the following calculations, which, by the property of similar triangles, will be found thus: in an embankment 46·5 feet high, slope of work $1\frac{3}{4}$ to 1, width of road 26 feet, and natural slope one in 14, the Half-widths of the same are required.

1st. Half-width of road = 13 and $\frac{13}{1\cdot75} = 7\cdot42$.
2nd. Vertical depth = $46\cdot5 + 7\cdot42 = 53\cdot92$.
3rd. Half-widths in Table III., slope of work $1\frac{3}{4}$ to 1, marked thus (*).

Lower side = 137·5.
Higher side = 106·94.

Half-width of road in Tables = 15 and by Table of Constants (see page 9) = 8·57.

Therefore,

as $(60 + 8{\cdot}57) = 68{\cdot}57 : 137{\cdot}5 :: 53{\cdot}92 : 108{\cdot}12$ lower side
as $68{\cdot}57 : 106{\cdot}94 :: 53{\cdot}92 : 84{\cdot}1$ higher side.

In most cases, the second places of decimals may be eliminated.

It will be seen, therefore, that the Tables may thus be applied readily to any dimensions of works, or any natural slopes whatever.

It is presumed that the inclinations or natural slopes inserted in the Tables embrace a range sufficient to meet every slope to be found within experience, and the Half-widths for any *intermediate* angle or slope may be readily found by a proportionate *between* the two slopes on the Table, within which the ascertained natural slope is found to lie; and it is thought that on the flatter slopes the variation will be so trifling, it will be scarcely necessary to make this calculation.

In the case, however, of a natural slope of one to 120; to find the Half-widths on the same the method of proceeding will be thus:—in a cutting of 40 feet in depth, slope of work 1¼ to 1, width of road 20 feet. Referring to Table II.

Natural slope, one to 100—

Half-width.		Half-width.
Higher side = 91·15		Lower side 88·91

Natural slope, one to 150—

Half-width.		Half-width.
Higher side =	90·77	Lower side 89·26
Difference	·38	·35

Therefore, as 150 : 120 :: 38 : 15—91·15 − 15 = 91·00
as 150 : 120 :: 35 : 14—88·91 + 14 = 89·05

Thus the Half-widths sought are 91·00 on the higher side, and 89·05 on the lower side.

The measures are given in feet and decimal parts of a foot throughout; but this may be replaced by any other unit of measure, either English or foreign, that may be desirable.

Constants convenient for reference in applying the Tables (see Diagrams *a*, *a*, Figs. 1 and 2) are given.

Depth of cutting or height of embankment = 60. Half-width of road = 15.

TABLE OF CONSTANTS.

Slope of work	$\frac{1}{8}$ to 1 =	120	Depth or height below or above the level of roadway, according to the respective slopes of work.
"	$\frac{1}{4}$ to 1 =	60	
"	$\frac{1}{2}$ to 1 =	30	
"	$\frac{3}{4}$ to 1 =	20	
"	1 to 1 =	15	
"	$1\frac{1}{4}$ to 1 =	12	
"	$1\frac{1}{2}$ to 1 =	10	
"	$1\frac{3}{4}$ to 1 =	8·57	
"	2 to 1 =	7·5	
"	$2\frac{1}{4}$ to 1 =	6·66	
"	$2\frac{1}{2}$ to 1 =	6	
"	$2\frac{3}{4}$ to 1 =	5·45	
"	3 to 1 =	5	
"	$3\frac{1}{4}$ to 1 =	4·6	
"	$3\frac{1}{2}$ to 1 =	4·28	
"	$3\frac{3}{4}$ to 1 =	4	
"	4 to 1 =	3·75	
"	$4\frac{1}{4}$ to 1 =	3·52	
"	$4\frac{1}{2}$ to 1 =	3·33	
"	$4\frac{3}{4}$ to 1 =	3·15	
"	5 to 1 =	3	
"	$5\frac{1}{4}$ =	2·85	
"	$5\frac{1}{2}$ =	2·727	
"	$5\frac{3}{4}$ =	2·61	

In order to afford convenience for the necessary calculations in the use of the Tables, a sheet of skin is affixed to the back of the book, which will permit the free use of the pencil for that purpose, and then easily expunged.

The following Tables are headed Higher, Lower, which are abbreviations of Higher side and Lower side, respectively.

TABLE I.

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. ½ to 1.		Slope of Work. ½ to 1.		Slope of Work. ½ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 1	45	0	0	36·36	28·28	56·56	33·93	127·28	42·42
One to 1·17	40	30	0	33·12	26·89	50·16	32·52	103·29	41·47
One to 1·376	36	0	0	30·59	25·50	45·32	31·38	87·36	40·80
One to 1·632	31	30	0	28·58	24·33	41·56	30·52	76·10	40·40
One to 1·962	27	0	0	26·97	23·74	38·59	29·87	67·77	40·25
One to 2·41	22	30	0	25·68	23·15	36·23	29·43	61·42	40·34
One to 2·52	21	39	15	25·49	23·06	35·83	29·36	60·32	40·40
One to 2·65	20	37	0	25·22	22·96	35·38	29·29	59·22	40·47
One to 2·82	19	32	20	24·98	22·86	34·93	29·23	57·86	40·58
One to 3·08	18	0	0	24·66	22·74	34·34	29·18	56·50	40·70
One to 3·19	17	22	0	24·53	22·69	34·09	29·15	55·71	40·79
One to 3·42	16	18	49	24·33	22·62	33·72	29·12	54·92	40·90
One to 3·69	15	10	32	24·13	22·55	33·45	29·11	53·95	41·06
One to 4	14	2	11	23·94	22·49	32·98	29·10	53·02	41·23
One to 4·36	12	55	4	23·76	22·44	32·65	29·09	52·16	41·42
One to 4·8	11	46	3	23·60	22·39	32·36	29·12	51·32	41·63
One to 5	11	18	39	23·53	22·38	32·20	29·13	51·00	41·72
One to 5·24	10	48	49	23·46	22·37	32·07	29·15	50·66	41·82
One to 6	9	27	44	23·30	22·34	31·73	29·19	49·77	42·12
One to 6·31	9	0	0	23·24	22·33	31·63	29·22	49·48	42·22
One to 6·84	8	18	20	23·16	22·33	31·46	29·25	49·06	42·39
One to 7	8	7	48	23·14	22·33	31·43	29·26	48·96	42·43
One to 8	7	7	30	23·05	22·33	31·20	29·31	48·38	42·68
One to 9	6	20	25	22·96	22·33	31·04	29·36	47·94	42·90
One to 9·6	5	56	48	22·92	22·33	30·96	29·39	47·73	43·00
One to 10	5	42	38	22·90	22·33	30·92	29·41	47·61	43·08
One to 11	5	11	40	22·85	22·34	30·82	29·44	47·36	43·22
One to 12	4	45	50	22·82	22·35	30·73	29·48	47·12	43·36
One to 12·706	4	30	02	22·80	22·36	30·70	29·51	46·98	43·44
One to 13	4	23	55	22·78	22·36	30·67	29·52	46·94	43·47
One to 14	4	5	8	22·76	22·37	30·63	29·54	46·80	43·56
One to 15	3	48	51	22·74	22·37	30·58	29·56	46·66	43·65
One to 16	3	34	35	22·72	22·37	30·53	29·59	46·54	43·72
One to 17	3	21	59	22·70	22·38	30·50	29·60	46·45	43·78
One to 18	3	10	47	22·69	22·38	30·47	29·62	46·36	43·85

TABLE I.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. ¼ to 1.		Slope of Work. ½ to 1.		Slope of Work. ¾ to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 19	3 0 46	22·68	22·38	30·44	29·64	46·28	43·90
One to 20	2 51 44	22·67	22·39	30·41	29·66	46·21	43·96
One to 21	2 43 34	22·66	22·39	30·39	29·68	46·16	44·01
One to 22	2 36 9	22·65	22·40	30·38	29·69	46·10	44·05
One to 23	2 29 22	22·64	22·40	30·36	29·70	46·05	44·08
One to 24	2 23 9	22·63	22·40	30·34	29·72	46·00	44·12
One to 25	2 17 26	22·63	22·41	30·32	29·73	45·96	44·15
One to 26	2 12 9	22·63	22·41	30·31	29·74	45·92	44·18
One to 27	2 7 15	22·62	22·41	30·30	29·74	45·88	44·22
One to 28	2 2 43	22·62	22·41	30·29	29·75	45·85	44·24
One to 29	1 58 29	22·62	22·42	30·28	29·75	45·82	44·26
One to 30	1 54 33	22·61	22·42	30·27	29·76	45·79	44·29
One to 31	1 50 51	22·61	22·42	30·27	29·76	45·77	44·31
One to 32	1 47 23	22·61	22·42	30·26	29·77	44·74	44·33
One to 33	1 44 8	22·60	22·42	30·26	29·78	44·72	44·35
One to 34	1 41 5	22·60	22·42	30·25	29·78	44·69	44·37
One to 35	1 38 11	22·59	22·43	30·24	29·79	45·67	44·39
One to 36	1 35 28	22·59	22·43	30·23	29·80	45·65	44·41
One to 37	1 32 53	22·59	22·43	30·22	29·80	45·64	44·42
One to 38	1 30 26	22·59	22·43	30·21	29·81	45·62	44·44
One to 39	1 28 7	22·59	22·43	30·20	29·81	45.60	44·45
One to 40	1 25 55	22·58	22·43	30·19	29·82	45·59	44·46
One to 41	1 23 49	22·58	22·43	30·19	29·82	45·57	44·47
One to 42	1 21 50	22·58	22·44	30·18	29·83	45·56	44·49
One to 43	1 19 56	22·58	22·44	30·18	29·83	45·55	44·50
One to 44	1 18 7	22·58	22·44	30·17	29·84	45·53	44·51
One to 45	1 16 23	22·57	22·44	30·17	29·84	45·52	44·52
One to 46	1 14 43	22·57	22·44	30·16	29·84	45·50	44·53
One to 47	1 13 7	22·57	22·44	30·16	29·85	45·49	44·54
One to 48	1 11 36	22·57	22·44	30·16	29·85	45·48	44·55
One to 49	1 10 9	22·57	22·44	30·16	29·85	45·47	44·56
One to 50	1 8 45	22·56	22·45	30·16	29·85	45·46	44·57
One to 51	1 7 23	22·56	22·45	30·15	29·85	45·45	44·58
One to 52	1 6 6	22·56	22·45	30·15	29·85	45·44	44·59
One to 53	1 4 51	22·56	22·45	30·15	29·86	45·43	44·59

TABLE I.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. ½ to 1.		Slope of Work. ¾ to 1.		Slope of Work. 1 to 1.	
		Embankment.		Embankment		Embankment.	
		Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
		Cutting.		Cutting.		Cutting.	
		Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 54	1 3 39	22·56	22·45	30·14	29·86	45·42	44·60
One to 55	1 2 29	22·56	22·45	30·14	29·86	45·42	44·61
One to 56	1 1 23	22·56	22·45	30·14	29·86	45·41	44·61
One to 57	1 0 18	22·56	22·45	30·14	29·86	45·41	44·62
One to 58	0 59 16	22·56	22·45	30·13	29·86	45·40	44·62
One to 59	0 58 15	22·56	22·45	30·13	29·87	45·40	44·63
One to 60	0 57 17	22·55	22·45	30·13	29·87	45·39	44·64
One to 61	0 56 21	22·55	22·46	30·13	29·87	45·39	44·64
One to 62	0 55 26	22·55	22·46	30·12	29·87	45·38	44·65
One to 63	0 54 33	22·55	22·46	30·12	29·87	45·37	44·65
One to 64	0 53 42	22·55	22·46	30·12	29·87	45·37	44·66
One to 65	0 52 53	22·55	22·46	30·12	29·88	45·36	44·66
One to 66	0 52 5	22·55	22·46	30·11	29·88	45·35	44·67
One to 67	0 51 18	22·55	22·46	30·11	29·88	45·35	44·67
One to 68	0 50 33	22·55	22·46	20·11	29·88	45·34	44·68
One to 69	0 49 49	22·55	22·46	30·11	29·88	45·34	44·68
One to 70	0 49 6	22·55	22·46	30·11	29·89	45·33	44·69
One to 71	0 48 24	22·55	22·46	30·10	29·89	45·33	44·69
One to 72	0 47 44	22·55	22·46	30·10	29·89	45·33	44·69
One to 73	0 47 5	22·55	22·46	30·10	29·89	45·32	44·69
One to 74	0 46 27	22·55	22·46	30·10	29·89	45·32	44·70
One to 75	0 45 50	22·55	22·46	30·10	29·90	45·32	44·70
One to 76	0 45 13	22·55	22·46	30·10	29·90	45·31	44·70
One to 77	0 44 40	22·55	22·46	30·10	29·90	45·31	44·71
One to 78	0 44 4	22·55	22·46	30·10	29·90	45·31	44·71
One to 79	0 43 30	22·55	22·46	30·09	29·90	45·30	44·72
One to 80	0 42 58	22·54	22·47	30·09	29·91	45·30	44·72
One to 81	0 42 26	22·54	22·47	30·09	29·91	45·30	44·72
One to 82	0 41 55	22·54	22·47	30·09	29·91	45·29	44·73
One to 83	0 41 25	22·54	22·47	30·09	29·91	45·29	44·73
One to 84	0 40 55	22·54	22·47	30·09	29·91	45·28	44·74
One to 85	0 40 26	22·54	22·47	30·09	29·91	45·28	44·74
One to 86	0 39 58	22·54	22·47	30·09	29·91	45·27	44·74
One to 87	0 39 31	22·54	22·47	30·09	29·91	45·27	44·75
One to 88	0 39 3	22·54	22·47	30·09	29·91	45·26	44·75

TABLE I.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. ¼ to 1.		Slope of Work. ½ to 1.		Slope of Work. ½ to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 89	0 38 37	22·54	22·47	30·09	29·91	45·26	44·75
One to 90	0 38 11	22·53	22·47	30·08	29·92	45·25	44·76
One to 91	0 37 46	22·53	22·47	30·08	29·92	45·25	44·76
One to 92	0 37 22	22·53	22·47	30·08	29·92	45·25	44·76
One to 93	0 36 57	22·53	22·47	30·08	29·92	45·25	44·76
One to 94	0 36 34	22·53	22·47	30·08	29·92	45·25	44·76
One to 95	0 36 11	22·53	22·47	30·07	29·92	45·24	44·77
One to 96	0 35 48	22·53	22·47	30·07	29·92	45·24	44·77
One to 97	0 35 26	22·53	22·47	30·07	29·92	45·24	44·77
One to 98	0 35 4	22·53	22·47	30·07	29·92	45·24	44·77
One to 99	0 34 43	22·53	22·47	30·07	29·92	45·24	44·77
One to 100	0 34 23	22·53	22·47	30·07	29·92	45·23	44·78
One to 150	0 22 55	22·53	22·48	30·04	29·94	45·16	44·85
One to 300	0 11 27	22·53	22·48	30·04	29·95	45·15	44·88
Level	.. ..	22·50	22·50	30·00	30·00	45·00	45·00

TABLE II.

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. ¼ to 1.		Slope of Work. 1 to 1.		Slope of Work. 1½ to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 1	45 0 0	339·41	48·49	..	..	..	..
One to 1·17	40 30 0	219·52	48·10	..	..	..	..
One to 1·376	36 0 0	162·97	48·00	339·01	53·69	..	..
One to 1·632	31 30 0	130·31	48·21	227·18	54·54	451·22	59·77
One to 1·962	27 0 0	108·99	48·72	171·62	55·76	278·25	61·70

TABLE II.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. ¼ to 1.		Slope of Work. 1 to 1.		Slope of Work. 1½ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 2·414	22	30	0	94·21	49·55	138·58	57·40	202·05	64·18
One to 2·52	21	39	15	91·93	49·74	133·83	57·76	192·27	64·72
One to 2·65	20	37	0	89·30	50·00	128·46	58·23	181·55	65·41
One to 2·82	19	32	20	86·76	50·28	123·36	58·74	171·67	66·16
One to 3·08	18	0	0	83·42	50·69	116·81	59·52	159·33	67·29
One to 3·19	17	22	0	82·13	50·88	114·35	59·86	154·85	67·80
One to 3·42	16	18	49	80·10	51·27	110·49	60·45	147·89	68·66
One to 3·69	15	10	32	78·04	51·66	106·63	61·13	141·11	69·64
One to 4	14	2	11	76·14	52·08	103·09	61·84	135·01	70·68
One to 4·36	12	55	4	74·36	52·52	99·88	62·58	129·51	71·76
One to 4·8	11	46	3	72·65	53·01	96·79	63·40	124·35	72·94
One to 5	11	18	39	71·99	53·21	95·61	63·74	122·34	73·43
One to 5·24	10	48	49	71·30	53·43	94·38	64·11	120·38	73·97
One to 6	9	27	44	69·64	54·11	91·08	65·23	115·00	75·61
One to 6·31	9	0	18	68·94	54·30	90·23	65·55	113·61	76·07
One to 6·84	8	18	20	68·10	54·65	88·76	66·14	111·28	76·93
One to 7	8	7	48	67·88	54·75	88·39	66·29	110·69	77·14
One to 8	7	7	30	66·72	55·28	86·39	67·18	107·52	78·45
One to 9	6	20	25	65·86	55·73	84·89	67·92	105·17	79·52
One to 9·6	5	56	48	65·44	55·90	84·17	68·29	104·04	80·07
One to 10	5	42	38	65·19	56·10	83·75	68·52	103·38	80·41
One to 11	5	11	40	64·71	56·38	82·92	68·99	101·97	81·16
One to 12	4	45	50	64·22	56·67	82·10	69·47	100·83	81·80
One to 12·706	4	30	0	63·96	56·85	81·66	69·75	100·12	82·19
One to 13	4	23	55	63·86	56·89	81·49	69·85	99·88	82·36
One to 14	4	5	8	63·59	57·08	81·01	70·16	99·09	82·84
One to 15	3	48	51	63·30	57·27	80·53	70·47	98·41	83·27
One to 16	3	34	35	63·07	57·43	80·16	70·74	97·83	83·65
One to 17	3	21	59	62·87	57·56	79·83	70·95	97·32	83·99
One to 18	3	10	47	62·71	57·70	79·55	71·15	96·88	84·29
One to 19	3	0	46	62·56	57·80	79·28	71·35	96·50	84·55
One to 20	2	51	44	62·41	57·91	79·06	71·51	96·13	84·82
One to 21	2	43	34	62·29	58·00	78·84	71·68	95·83	85·04
One to 22	2	36	9	62·18	58·09	78·68	71·81	95·53	85·26
One to 23	2	29	22	62·09	58·16	78·51	71·94	95·28	85·44

TABLE II.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet, Width of Road, 30 Feet.					
				Slope of Work. ¾ to 1.		Slope of Work. 1 to 1.		Slope of Work. 1½ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 24	2	23	9	61·99	58·23	78·33	72·06	95·03	85·63
One to 25	2	17	26	61·91	58·29	78·22	72·16	94·83	85·79
One to 26	2	12	9	61·83	58·36	78·10	72·26	94·63	85·96
One to 27	2	7	15	61·76	58·41	77·99	72·35	94·45	86·09
One to 28	2	2	43	61·69	58·46	77·87	72·44	94·28	86·22
One to 29	1	58	29	61·63	58·51	77·75	72·53	94·13	86·33
One to 30	1	54	33	61·57	58·57	77·63	72·62	93·98	86·45
One to 31	1	50	51	61·52	58·61	77·56	72·69	93·85	86·56
One to 32	1	47	23	61·48	58·65	77·48	72·75	93·72	86·67
One to 33	1	44	8	61·43	58·69	77·40	72·81	93·60	86·76
One to 34	1	41	5	61·39	58·73	77·32	72·88	93·49	86·85
One to 35	1	38	11	61·34	58·77	77·24	72·95	93·38	86·94
One to 36	1	35	28	61·30	58·80	77·18	73·00	93·30	87·02
One to 37	1	32	53	61·27	58·83	77·13	73·05	93·21	87·09
One to 38	1	30	26	61·24	58·86	77·07	73·09	93·12	87·16
One to 39	1	28	7	61·20	58·89	77·01	73·14	93·03	87·23
One to 40	1	25	55	61·17	58·92	76·95	73·19	92·94	87·31
One to 41	1	23	49	61·14	58·94	76·91	73·23	92·88	87·37
One to 42	1	21	50	61·12	58·96	76·86	73·27	92·81	87·43
One to 43	1	19	56	61·09	58·98	76·81	73·31	92·74	87·48
One to 44	1	18	7	61·06	59·00	76·76	73·35	92·67	87·54
One to 45	1	16	23	61·03	59·03	76·72	73·39	92·60	87·60
One to 46	1	14	43	61·00	59·05	76·68	73·42	92·54	87·65
One to 47	1	13	7	60·98	59·07	76·64	73·45	92·49	87·70
One to 48	1	11	36	60·96	59·09	76·61	73·49	92·43	87·75
One to 49	1	10	9	60·94	59·11	76·58	73·52	92·39	87·79
One to 50	1	8	45	60·93	59·13	76·55	73·55	92·34	87·83
One to 51	1	7	23	60·92	59·15	76·52	73·58	92·29	87·87
One to 52	1	6	6	60·90	59·16	76·49	73·61	92·25	87·91
One to 53	1	4	51	60·89	59·18	76·46	73·63	92·20	87·95
One to 54	1	3	39	60·87	59·19	76·43	73·65	92·16	87·99
One to 55	1	2	29	60·85	59·21	76·40	73·68	92·12	88·03
One to 56	1	1	23	60·84	59·22	76·38	73·70	92·08	88·06
One to 57	1	0	18	60·82	59·24	76·35	73·72	92·04	88·09
One to 58	0	59	16	60·80	59·25	76·32	73·74	92·00	88·12

TABLE II.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. $\frac{3}{4}$ to 1.		Slope of Work. 1 to 1.		Slope of Work. $1\frac{1}{2}$ to 1.	
		Embankment. Lower.	Cutting. Higher.	Embankment. Lower.	Cutting. Higher.	Embankment. Lower.	Cutting. Higher.
		Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 59	0 58 15	60·78	59·26	76·30	73·77	92·97	88·15
One to 60	0 57 17	60·77	59·27	76·28	73·79	91·94	88·19
One to 61	0 56 21	60·76	59·28	76·26	73·81	91·91	88·21
One to 62	0 55 26	60·74	59·29	76·24	73·82	91·88	88·24
One to 63	0 54 33	60·73	59·30	76·22	73·84	91·85	88·26
One to 64	0 53 42	60·72	59·31	76·20	73·85	91·82	88·28
One to 65	0 52 53	60·71	59·32	76·19	73·87	91·79	88·31
One to 66	0 52 5	60·70	59·33	76·18	73·88	91·76	88·34
One to 67	0 51 18	60·69	59·34	76·16	73·89	91·73	88·36
One to 68	0 50 33	60·68	60·35	76·14	73·91	91·70	88·39
One to 69	0 49 49	60·67	60·36	76·12	73·93	91·68	88·42
One to 70	0 49 6	60·66	59·37	76·10	73·95	91·66	88·44
One to 71	0 48 24	60·65	59·38	76·09	73·97	91·64	88·46
One to 72	0 47 44	60·64	59·39	76·08	73·98	91·62	88·48
One to 73	0 47 5	60·63	59·40	76·07	73·99	91·60	88·50
One to 74	0 46 27	60·63	59·40	76·06	74·00	91·58	88·51
One to 75	0 45 50	60·62	59·41	76·05	74·02	91·56	88·53
One to 76	0 45 13	60·61	59·42	76·03	74·03	91·54	88·55
One to 77	0 44 40	60·60	59·43	76·01	74·05	91·51	88·57
One to 78	0 44 4	60·59	59·43	75·99	74·06	91·49	88·59
One to 79	0 43 30	60·58	59·44	75·97	74·07	91·47	88·61
One to 80	0 42 58	60·57	59·45	75·96	74·08	91·45	88·63
One to 81	0 42 26	60·57	59·45	75·95	74·09	91·43	88·64
One to 82	0 41 55	60·56	59·46	75·94	74·10	91·41	88·66
One to 83	0 41 25	60·55	59·46	75·92	74·11	91·39	88·67
One to 84	0 40 55	60·54	59·47	75·91	74·12	91·37	88·69
One to 85	0 40 26	60·54	59·47	75·90	74·13	91·35	88·70
One to 86	0 39 58	60·53	59·48	75·89	74·14	91·34	88·72
One to 87	0 39 31	60·53	59·48	75·88	74·15	91·32	88·73
One to 88	0 39 3	60·52	59·49	75·87	74·16	91·31	88·75
One to 89	0 38 37	60·52	59·49	75·86	74·17	91·29	88·76
One to 90	0 38 11	60·51	59·50	75·85	74·18	91·28	88·78
One to 91	0 37 46	60·51	59·50	75·84	74·19	91·27	88·79
One to 92	0 37 22	60·50	59·51	75·83	74·20	91·25	88·80
One to 93	0 36 57	60·50	59·52	75·82	74·20	91·24	88·82

TABLE II.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. ¾ to 1.		Slope of Work. 1 to 1.		Slope of Work. 1¼ to 1.	
		Embankment.		Embankment.		Embankment.	
		Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
		Cutting.		Cutting.		Cutting.	
		Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 94	0 36 34	60·49	59·53	75·81	74·21	91·22	88·83
One to 95	0 36 11	60·49	59·53	75·81	74·22	91·21	88·84
One to 96	0 35 48	60·48	59·54	75·80	74·23	91·20	88·85
One to 97	0 35 26	60·48	59·54	75·79	74·24	91·19	88·86
One to 98	0 35 4	60·47	59·55	75·78	74·25	91·17	88·88
One to 99	0 34 43	60·47	59·55	75·77	74·25	91·16	88·90
One to 100	0 34 23	60·46	59·56	75·76	74·26	91·15	88·91
One to 150	0 22 55	60·33	59·73	75·50	74·50	90·77	89·26
One to 300	0 11 27	60·15	59·85	75·25	74·75	90·38	89·63
Level ..	.. ..	60·00	60·00	75·00	75·00	90·00	90·00

TABLE III.

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 1¼ to 1.		Slope of Work. 1½ to 1.		Slope of Work. 2 to 1.	
		Embankment.		Embankment.		Embankment.	
		Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
		Cutting.		Cutting.		Cutting.	
		Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 1·632	31 30 0	1524·0	64·17	..	..	..	..
One to 1·962	27 0 0	499·94	66·79	..	..	..	..
One to 2·41	22 30 0	300·12	70·09	..	..	..	..
One to 2·52	21 39 15	279·31	70·81	..	..	..	..
One to 2·65	20 37 0	257·49	71·72	..	..	..	..
One to 2·82	19 32 20	238·23	72·71	..	..	..	..
One to 3·08	18 0 0	215·37	74·23	292·51	80·44	405·55	86·04
One to 3·19	17 22 4	207·24	74·88	277·78	81·26	377·88	87·03
One to 3·42	16 18 49	195·02	76·03	256·33	82·69	339·36	88·73
One to 3·69	15 10 32	183·42	77·34	236·69	84·32	305·82	90·69

TABLE III.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 1½ to 1.		Slope of Work. 1¼ to 1.		Slope of Work. 2 to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 4	14 2 49	173·26	78·70	220·06	86·03	278·63	92·76
One to 4·36	12 55 38	164·29	80·14	205·79	88·68	256·13	94·95
One to 4·8	11 46 32	156·06	81·72	192·99	89·82	236·57	97·34
One to 5	11 18 37	152·97	82·37	188·29	90·65	229·52	98·35
One to 5·24	10 48 49	149·82	83·09	183·52	91·57	222·45	99·46
One to 6	9 27 44	141·93	85·16	171·76	94·18	205·34	102·66
One to 6·31	9 0 18	139·43	85·90	168·09	95·13	200·10	103·81
One to 6·84	8 18 20	136·72	87·05	162·92	96·59	192·76	105·61
One to 7	8 7 48	134·99	87·35	161·64	96·98	190·96	106·08
One to 8	7 7 30	130·34	89·11	154·81	99·23	181·45	108·85
One to 9	6 20 25	126·78	90·56	149·89	101·09	174·67	111·15
One to 9·6	5 56 48	125·20	91·27	147·67	102·00	171·64	112·28
One to 10	5 42 38	124·15	91·76	146·19	102·64	169·62	113·08
One to 11	5 11 40	122·08	92·78	143·30	103·96	165·71	114·72
One to 12	4 45 50	120·42	93·66	140·98	105·09	162·59	116·13
One to 12·706	4 30 0	119·44	94·22	139·63	105·79	160·74	117·02
One to 13	4 23 55	119·05	94·42	139·08	106·13	160·05	117·36
One to 14 (*)	4 5 8	117·89	95·08	137·50	106·94	157·93	118·44
One to 15	3 48 51	116·93	95·67	136·16	107·71	156·15	119·40
One to 16	3 34 35	116·14	96·19	135·02	108·39	154·62	120·25
One to 17	3 21 59	115·36	96·65	134·01	108·99	153·29	121·01
One to 18	3 10 47	114·76	97·05	133·13	109·54	152·13	121·71
One to 19	3 0 46	114·16	97·45	132·36	110·04	151·12	122·33
One to 20	2 51 44	113·69	97·77	131·68	110·49	150·21	122·90
One to 21	2 43 34	113·24	98·09	131·09	110·88	149·40	123·42
One to 22	2 36 9	112·79	98·40	130·51	111·28	148·68	123·90
One to 23	2 29 22	112·44	98·65	130·03	111·61	148·02	124·34
One to 24	2 23 9	112·09	98·91	129·55	111·95	147·43	124·74
One to 25	2 17 26	111·80	99·13	129·16	112·24	140·88	125·12
One to 26	2 12 9	111·51	99·35	128·76	112·52	146·38	125·47
One to 27	2 7 15	111·27	99·53	128·42	112·77	145·92	125·80
One to 28	2 2 43	111·03	99·71	128·09	113·02	145·51	126·09
One to 29	1 58 29	110·79	99·90	127·80	113·24	145·11	126·38
One to 30	1 54 33	110·60	100·05	127·51	113·45	144·76	126·64
One to 31	1 50 51	110·41	100·20	127·26	113·65	144·41	126·90

TABLE III.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. $1\frac{1}{2}$ to 1.		Slope of Work. $1\frac{3}{4}$ to 1.		Slope of Work. 2 to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 32	1	47	23	110·22	100·35	127·01	113·84	144·09	127·14
One to 33	1	44	8	110·07	100·48	126·82	113·99	143·84	127·33
One to 34	1	41	5	109·91	100·61	126·62	114·14	143·59	127·52
One to 35	1	38	11	109·75	100·73	126·41	114·31	143·30	127·74
One to 36	1	35	28	109·63	100·84	126·19	114·48	143·02	127·96
One to 37	1	32	53	109·51	100·95	126·02	114·62	143·79	128·14
One to 38	1	30	26	109·39	101·05	125·85	114·76	142·57	128·32
One to 39	1	28	7	109·26	101·16	125·68	114·90	142·37	128·47
One to 40	1	25	55	109·12	101·27	125·50	115·04	142·17	128·63
One to 41	1	23	49	108·98	101·37	125·32	115·18	141·92	128·83
One to 42	1	21	50	108·84	101·48	125·15	115·33	141·67	129·03
One to 43	1	19	56	108·78	101·53	125·07	115·40	141·58	129·10
One to 44	1	18	7	108·71	101·59	124·98	115·47	141·49	129·18
One to 45	1	16	23	108·65	101·64	124·90	115·54	141·34	129·30
One to 46	1	14	43	108·57	101·71	124·79	115·63	141·19	129·42
One to 47	1	13	7	108·48	101·77	124·68	115·73	141·05	129·54
One to 48	1	11	36	108·40	101·84	124·56	115·82	140·91	129·66
One to 49	1	10	9	108·34	101·90	124·47	115·89	140·79	129·75
One to 50	1	8	45	108·27	101·96	124·38	115·97	140·67	129·85
One to 51	1	7	23	108·20	102·01	124·30	116·04	140·56	129·95
One to 52	1	6	6	108·14	102·07	124·21	116·12	140·45	130·05
One to 53	1	4	51	108·08	102·12	124·13	116·18	140·34	130·16
One to 54	1	3	39	108·02	102·17	124·05	116·25	140·24	130·27
One to 55	1	2	29	107·96	102·23	123·97	116·32	140·14	130·39
One to 56	1	1	23	107·91	102·27	123·90	116·38	140·06	130·45
One to 57	1	0	18	107·86	102·32	123·83	116·44	139·97	130·51
One to 58	0	59	16	107·81	102·36	123·77	116·50	139·88	130·57
One to 59	0	58	15	107·76	102·40	123·70	116·56	139·79	130·63
One to 60	0	57	17	107·71	102·45	123·63	116·62	139·70	130·68
One to 61	0	56	21	107·66	102·49	123·57	116·67	139·62	130·74
One to 62	0	55	26	107·62	102·53	123·51	116·72	139·55	130·81
One to 63	0	54	33	107·58	102·56	123·45	116·77	139·47	130·87
One to 64	0	53	42	107·53	102·60	123·40	116·82	139·40	130·94
One to 65	0	52	53	107·49	102·64	123·34	116·87	139·33	131·01
One to 66	0	52	5	107·45	102·68	123·29	116·91	139·26	131·05
One to 67	0	51	18	107·41	102·71	123·24	116·95	139·20	131·10

TABLE III.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 1½ to 1.		Slope of Work. 1¾ to 1.		Slope of Work. 2 to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 68	0 50 33	107·37	102·74	123·20	117·00	139·13	131·16
One to 69	0 49 49	107·34	102·78	123·15	117·05	139·07	131·22
One to 70	0 49 6	107·31	102·81	123·10	117·09	139·01	131·28
One to 71	0 48 24	107·28	102·84	123·06	117·13	138·96	131·33
One to 72	0 47 44	107·25	102·87	123·01	117·17	138·91	131·38
One to 73	0 47 5	107·21	102·90	122·97	117·21	138·85	131·43
One to 74	0 46 27	107·18	102·93	122·92	117·25	138·79	131·48
One to 75	0 45 50	107·15	102·95	122·88	117·28	138·74	131·53
One to 76	0 45 13	107·12	102·98	122·84	117·32	138·70	131·57
One to 77	0 44 40	107·10	103·00	122·80	117·35	138·65	131·61
One to 78	0 44 4	107·07	103·03	122·76	117·38	138·60	131·66
One to 79	0 43 30	107·04	103·05	122·73	117·42	138·55	131·70
One to 80	0 42 58	107·02	103·08	122·70	117·45	138·50	131·74
One to 81	0 42 26	107·00	103·10	122·66	117·48	138·46	131·77
One to 82	0 41 55	106·98	103·12	122·63	117·51	138·42	131·81
One to 83	0 41 25	106·95	103·14	122·60	117·53	138·38	131·84
One to 84	0 40 55	106·93	103·16	122·57	117·56	138·34	131·88
One to 85	0 40 26	106·91	103·18	122·54	117·59	138·30	131·91
One to 86	0 39 58	106·89	103·20	122·51	117·62	138·26	131·95
One to 87	0 39 31	106·86	103·23	122·48	117·65	138·22	131·98
One to 88	0 39 3	106·83	103·25	122·45	117·68	138·18	132·02
One to 89	0 38 37	106·81	103·27	122·42	117·70	138·14	132·05
One to 90	0 38 11	106·79	103·29	122·39	117·72	138·10	132·09
One to 91	0 37 46	106·77	103·31	122·37	117·74	138·06	132·12
One to 92	0 37 22	106·75	103·33	122·35	117·77	138·03	132·15
One to 93	0 36 57	106·72	103·34	122·32	117·79	138·00	132·19
One to 94	0 36 34	106·71	103·36	122·30	117·81	137·97	132·22
One to 95	0 36 11	106·69	103·38	122·27	117·84	137·94	132·25
One to 96	0 35 48	106·67	103·39	122·25	117·86	137·91	132·28
One to 97	0 35 26	106·65	103·41	122·22	117·88	137·87	132·31
One to 98	0 35 4	106·64	103·43	122·20	117·90	137·84	132·34
One to 99	0 34 43	106·62	103·45	122·17	117·93	137·81	132·36
One to 100	0 34 23	106·61	103·46	122·15	117·95	137·78	132·38
One to 150	0 22 55	106·06	103·96	121·42	118·62	136·85	133·25
One to 300	0 11 27	105·53	104·48	120·71	119·31	135·93	134·13
Level ..	.. ..	105·00	105·00	120·00	120·00	135·00	135·00

TABLE IV.

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 2¼ to 1.		Slope of Work. 2½ to 1.		Slope of Work. 2¾ to 1.	
		Embankment. Lower.	Higher	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 3·08	18 0 0	586·67	91·11	..	..	..	..
One to 3·19	17 22 0	530·52	92·25	..	..	..	..
One to 3·42	16 18 49	457·81	94·24	..	..	..	..
One to 3·69	15 10 32	398·88	96·51	..	..	..	..
One to 4	14 2 11	353·48	98·95	453·66	104·67	593·74	109·94
One to 4·36	12 55 4	318·05	101·51	396·90	107·60	500·10	113·24
One to 4·8	11 46 3	288·43	104·31	351·78	110·83	430·46	116·89
One to 5	11 18 39	278·17	105·50	336·61	112·19	407·95	118·43
One to 5·24	10 48 49	267·86	106·82	321·56	113·70	386·03	120·15
One to 6	9 27 44	243·33	119·60	286·80	118·08	336·88	125·13
One to 6·31	9 00 18	236·05	111·96	276·71	119·66	323·01	126·92
One to 6·84	8 18 20	225·75	114·11	262·68	122·16	303·90	129·79
One to 7	8 7 48	223·32	114·67	259·31	122·82	299·49	130·54
One to 8	7 7 30	210·38	117·99	241·93	127·00	276·47	134·99
One to 9	6 20 25	201·24	120·74	229·90	129·94	260·80	138·74
One to 9·6	5 56 48	197·22	122·11	224·61	131·54	253·98	140·58
One to 10	5 42 38	194·51	123·03	221·12	132·67	249·52	141·88
One to 11	5 11 40	189·36	125·04	214·44	135·01	241·00	144·60
One to 12	4 45 50	185·29	126·76	209·17	137·03	234·33	146·95
One to 12·706	4 30 0	182·91	127·82	206·14	138·33	230·51	148·40
One to 13	4 23 55	181·94	128·25	204·91	138·81	228·97	149·01
One to 14	4 5 8	179·18	129·56	201·40	140·37	224·57	150·83
One to 15	3 48 51	176·87	130·72	198·46	141·75	220·90	152·45
One to 16	3 34 35	174·91	131·78	195·99	143·01	217·79	153·90
One to 17	3 21 59	173·18	132·70	193·80	144·11	215·11	155·21
One to 18	3 10 47	171·70	133·54	191·93	145·12	212·79	156·49
One to 19	3 0 46	170·39	134·31	190·28	146·03	210·76	157·46
One to 20	2 51 44	169·23	135·00	188·82	146·86	208·96	158·44
One to 21	2 43 34	168·20	135·64	187·53	147·63	207·36	159·34
One to 22	2 36 9	167·27	136·22	186·36	148·33	205·93	160·17
One to 23	2 29 22	166·42	136·77	185·31	148·98	204·64	160·93
One to 24	2 23 9	165·68	137·28	184·36	149·58	203·47	161·64
One to 25	2 17 26	164·97	137·73	183·50	150·13	202·41	162·29
One to 26	2 12 9	164·36	138·15	182·71	150·65	201·44	162·91
One to 27	2 7 15	163·75	138·56	181·98	151·13	200·55	163·48

TABLE IV.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. 2½ to 1.		Slope of Work. 2½ to 1.		Slope of Work. 2¾ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 28	2	2	43	163·24	138·92	181·31	151·59	199·73	164·01
One to 29	1	58	29	162·72	139·29	180·69	152·01	198·98	164·51
One to 30	1	54	33	162·27	139·61	180·12	152·41	198·28	164·98
One to 31	1	50	51	161·83	139·93	179·58	152·77	197·62	165·42
One to 32	1	47	23	161·44	140·22	179·09	153·13	197·02	165·84
One to 33	1	44	8	161·05	140·50	178·62	153·47	196·46	166.23
One to 34	1	41	5	160·71	140·75	178·20	153·77	196·05	166·52
One to 35	1	38	11	160·37	141·00	177·78	154·07	195·51	166·90
One to 36	1	35	28	160·06	141·23	177·41	154·35	194·97	167·29
One to 37	1	32	53	159·74	141·46	177·04	154·63	194·54	167·60
One to 38	1	30	26	159·49	141·66	176·71	154·88	194·11	167·91
One to 39	1	28	7	159·24	141·87	176·38	155·13	193·72	168·21
One to 40	1	25	55	159·00	142·06	176·08	155·35	193·34	168·47
One to 41	1	23	49	158·76	142·24	175·78	155·58	193·00	168·73
One to 42	1	21	50	158·55	142·41	175·51	155·78	192·66	168·98
One to 43	1	19	56	158·33	142·58	175·25	155·99	192·36	169·23
One to 44	1	18	7	158·14	142·74	175·00	156·18	192·05	169·45
One to 45	1	16	23	157·94	142·90	174·76	156·37	191·76	169·68
One to 46	1	14	43	157·75	143·05	174·54	156·55	191·49	169·89
One to 47	1	13	7	157·58	143·20	174·33	156·72	191·23	170·09
One to 48	1	11	36	157·41	143·35	174·12	156·88	190·95	170·31
One to 49	1	10	9	157·25	143·47	174·92	157·03	190·74	170·48
One to 50	1	8	45	157·10	143·59	173·73	157·19	190·52	170·65
One to 51	1	7	23	156·95	143·70	173·55	157·34	190·31	170·82
One to 52	1	6	6	156·81	143·81	173·38	157·48	190·09	170·99
One to 53	1	4	51	156·68	143·92	173·21	157·61	189·89	171·15
One to 54	1	3	39	156·55	144·03	173·05	157·74	189·69	171·31
One to 55	1	2	29	156·44	144·12	172·89	157·86	189·51	171·46
One to 56	1	1	23	156·33	144·22	172·75	157·98	189·33	171·61
One to 57	1	0	18	156·22	144·31	172·61	158·10	189·16	171·74
One to 58	0	59	16	156·11	144·41	172·47	158·21	188·99	171·88
One to 59	0	58	15	155·99	144·50	172·34	158·33	188·83	172·01
One to 60	0	57	17	155·87	144·60	172·21	158·44	188·67	172·14
One to 61	0	56	21	155·77	144·68	172·09	158·54	188·52	172·26
One to 62	0	55	26	155·68	144·76	171·97	158·64	188·38	172·38

TABLE IV.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 2½ to 1.		Slope of Work. 2½ to 1.		Slope of Work. 2¾ to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 63	0 54 33	155·58	144·84	171·86	158·74	188·24	172·49
One to 64	0 53 42	155·49	144·92	171·75	158·83	188·11	172·61
One to 65	0 52 53	155·40	145·00	171·64	158·92	187·98	172·72
One to 66	0 52 5	155·32	145·07	171·53	159·00	187·85	172·82
One to 67	0 51 18	155·24	145·14	171·43	159·09	187·73	172·93
One to 68	0 50 33	155·16	145·22	171·33	159·18	187·61	173·03
One to 69	0 49 49	155·08	145·29	171·23	159·26	187·49	173·12
One to 70	0 49 6	155·00	145·36	171·14	159·34	187·38	173·22
One to 71	0 48 24	154·94	145·42	171·05	159·42	187·26	173·31
One to 72	0 47 44	154·87	145·48	171·96	159·50	187·14	173·40
One to 73	0 47 5	154·80	145·54	170·88	159·57	187·02	173·49
One to 74	0 46 27	154·73	145·60	170·80	159·64	186·94	173·57
One to 75	0 45 50	154·66	145·65	170·72	159·71	186·86	173·65
One to 76	0 45 13	154·60	145·70	170·64	159·78	186·78	173·73
One to 77	0 44 40	154·54	145·75	170·58	159·84	186·69	174·81
One to 78	0 44 4	154·48	145·80	170·49	159·90	186·60	174·88
One to 79	0 43 30	154·42	145·86	170·42	159·96	186·51	174·96
One to 80	0 42 58	154·36	145·91	170·35	160·03	186·42	174·04
One to 81	0 42 26	154·31	145·95	170·28	160·08	186·34	174·11
One to 82	0 41 55	154·26	146·00	170·22	160·14	186·26	174·18
One to 83	0 41 25	154·21	146·04	170·15	160·19	186·18	174·25
One to 84	0 40 55	154·16	146·09	170·09	160·25	186·11	174·32
One to 85	0 40 26	154·11	146·13	170·03	160·31	186·03	174·38
One to 86	0 39 58	154·06	146·18	169·98	160·36	185·96	174·44
One to 87	0 39 31	154·01	146·22	169·92	160·42	185·89	174·50
One to 88	0 39 3	153·96	146·27	169·86	160·47	185·83	174·56
One to 89	0 38 37	153·91	146·31	169·80	160·52	185·76	174·62
One to 90	0 38 11	153·86	146·36	169·74	160·57	185·69	174·68
One to 91	0 37 46	153·82	146·39	169·68	160·61	185·62	174·74
One to 92	0 37 22	153·78	146·43	169·63	160·65	185·56	174·79
One to 93	0 36 57	153·74	146·46	169·58	160·69	185·50	174·84
One to 94	0 36 34	153·70	146·50	169·53	160·74	185·44	174·89
One to 95	0 36 11	153·66	146·53	169·48	160·79	185·38	174·95
One to 96	0 35 48	153·62	146·57	169·43	160·83	185·32	175·0
One to 97	0 35 26	153·58	146·60	169·38	160·87	185·26	175·05

TABLE IV.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 2¼ to 1.		Slope of Work. 2½ to 1.		Slope of Work. 2¾ to 1.	
		Embankment.		Embankment.		Embankment.	
		Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
		Cutting.		Cutting.		Cutting.	
		Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 98	0 35 4	153·54	146·64	169·33	160·91	185·21	175·10
One to 99	0 34 43	153·50	146·67	169·29	160·95	185·15	175·15
One to 100	0 34 23	153·46	146·71	169·25	161·00	185·10	175·20
One to 150	0 22 55	152·29	147·79	167·82	162·32	183·36	176·76
One to 300	0 11 27	151·14	148·88	166·40	163·65	181·66	178·36
Level ..	.. ..	150·00	150·00	165·00	165·00	180·00	180·00

TABLE V.

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 3 to 1.		Slope of Work. 3¼ to 1.		Slope of Work. 3½ to 1.	
		Embankment.		Embankment.		Embankment.	
		Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
		Cutting.		Cutting.		Cutting.	
		Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 4	14 2 11	805·20	114·88	..	..	..	..
One to 4·36	12 55 4	642·12	118·54	..	..	..	..
One to 4·8	11 46 3	531·62	122·00	..	..	..	..
One to 5	11 18 39	497·63	124·32	615·10	129·93	..	..
One to 5·33	10 37 34	454·24	126·98	550·02	132·88	..	..
One to 6	9 27 44	395·67	131·83	446·30	138·26	..	..
One to 6·31	9 00 18	376·62	133·82	440·03	140·50	..	..
One to 6·84	8 18 20	350·83	137·08	405·17	144·10	..	..
One to 7	8 7 48	344·93	137·92	397·28	145·05	454·72	151·54
One to 8	7 7 30	314·61	142·95	357·50	150·68	403·23	157·75
One to 9	6 20 25	294·46	147·20	331·63	155·44	370·58	163·06
One to 9·6	5 56 48	285·32	149·42	320·04	157·95	356·10	165·80
One to 10	5 42 38	280·11	150·79	313·50	159·50	347·96	167·52
One to 11	5 11 40	269·37	153·90	300·06	163·00	331·46	171·42
One to 12	4 45 50	261·04	156·59	289·72	166·05	318·85	174·82

TABLE V.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. 3 to 1.		Slope of Work. 3½ to 1.		Slope of Work. 3½ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 12·706	4	30	0	256·18	158·29	283·72	167·97	311·57	176·97
One to 13	4	23	55	254·37	158·96	281·50	168·74	308·90	177·83
One to 14	4	5	8	248·93	161·01	274·83	171·12	300·84	180·49
One to 15	3	48	51	244·41	162·91	269·30	173·24	294·21	182·87
One to 16	3	34	35	240·58	164·58	264·64	175·14	288·64	185·01
One to 17	3	21	59	237·30	166·09	260·67	176·87	283·91	186·94
One to 18	3	10	47	234·47	167·46	257·23	178·43	279·81	188·69
One to 19	3	0	46	231·99	168·70	254·24	179·85	276·26	190·30
One to 20	2	51	44	229·80	169·84	251·60	181·16	273·13	191·77
One to 21	2	43	34	227·86	170·88	249·26	182·35	270·37	193·11
One to 22	2	36	9	226·12	171·84	247·17	183·45	267·91	194·35
One to 23	2	29	22	224·56	172·72	245·30	184·47	265·70	195·50
One to 24	2	23	9	223·14	173·54	243·61	185·41	263·70	196·57
One to 25	2	17	26	221·87	174·31	242·08	186·29	261·90	197·56
One to 26	2	12	9	220·69	175·02	240·67	187·11	260·25	198·49
One to 27	2	7	15	219·62	175·68	239·38	187·87	258·74	199·36
One to 28	2	2	43	218·63	176·30	238·21	188·58	257·37	200·17
One to 29	1	58	29	217·72	176·89	237·12	189·26	256·09	200·93
One to 30	1	54	33	216·88	177·43	236·12	189·89	254·92	201·64
One to 31	1	50	51	216·10	177·95	235·19	190·48	253·82	202·32
One to 32	1	47	23	215·37	178·44	234·32	191·04	252·81	202·96
One to 33	1	44	8	214·69	178·90	233·51	191·58	251·86	203·56
One to 34	1	41	5	214·05	179·33	232·71	192·03	250·97	204·11
One to 35	1	38	11	213·46	179·74	232·05	192·55	250·15	204·65
One to 36	1	35	28	212·90	180·13	231·39	193·01	249·39	205·18
One to 37	1	32	53	212·37	180·51	230·76	193·44	248·65	205·67
One to 38	1	30	26	211·87	180·86	230·17	193·85	247·96	206·14
One to 39	1	28	7	211·40	181·20	229·61	194·23	247·32	206·58
One to 40	1	25	55	210·96	181·52	229·09	194·61	246·71	207·00
One to 41	1	23	49	210·54	181·83	228·59	194·96	246·11	207·39
One to 42	1	21	50	210·10	182·12	228·12	195·30	245·56	207·78
One to 43	1	19	56	209·77	182·40	227·68	195·62	245·06	208·16
One to 44	1	18	7	209·41	182·66	227·25	195·94	244·57	208·51
One to 45	1	16	23	209·06	182·93	226·84	196·24	244·09	208·86
One to 46	1	14	43	208·74	183·17	226·45	196·52	243·65	209·18

TABLE V.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 3 to 1.		Slope of Work. 3½ to 1.		Slope of Work. 3½ to 1.	
		Embankment.		Embankment.		Embankment.	
		Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
		Cutting.		Cutting.		Cutting.	
		Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 47	1 13 7	208·43	183·40	226·09	196·79	243·21	209·50
One to 48	1 11 36	208·13	183·64	225·73	197·06	242·81	209·79
One to 49	1 10 9	207·85	183·85	225·40	197·32	242·41	210·08
One to 50	1 8 45	207·57	184·06	225·07	197·59	242·04	210·35
One to 51	1 7 23	207·31	184·26	224·77	197·81	241·67	210·63
One to 52	1 6 6	207·06	184·47	224·48	198·02	241·33	210·89
One to 53	1 4 51	206·83	184·65	224·20	198·24	241·00	211·14
One to 54	1 3 39	206·59	184·84	223·93	198·45	240·69	211·39
One to 55	1 2 29	206·37	185·02	223·66	198·65	240·39	211·61
One to 56	1 1 23	206·15	185·19	223·40	198·86	240·09	211·84
One to 57	1 0 18	205·95	185·35	223·15	199·04	239·81	212·06
One to 58	0 59 16	205·75	185·51	222·91	199·23	239·53	212·27
One to 59	0 58 15	205·56	185·66	222·70	199·40	239·27	212·47
One to 60	0 57 17	205·37	185·81	222·48	199·58	239·02	212·67
One to 61	0 56 21	205·19	185·95	222·27	199·74	238·78	212·86
One to 62	0 55 26	205·02	186·10	222·07	199·91	238·54	213·05
One to 63	0 54 33	204·86	186·23	221·87	200·06	238·31	213·23
One to 64	0 53 42	204·70	186·36	221·68	200·22	238·09	213·40
One to 65	0 52 53	204·54	186·49	221·50	200·37	237·88	213·57
One to 66	0 52 5	204·39	186·61	221·32	200·51	237·68	213·74
One to 67	0 51 18	204·24	186·73	221·16	200·65	237·48	213·89
One to 68	0 50 33	204·10	186·85	220·99	200·79	237·28	214·05
One to 69	0 49 49	203·96	186·96	220·82	200·92	237·10	214·20
One to 70	0 49 6	203·83	187·08	220·67	201·05	236·92	214·35
One to 71	0 48 24	203·70	187·18	220·49	201·18	236·75	214·49
One to 72	0 47 44	203·58	187·29	220·31	201·30	236·57	214·63
One to 73	0 47 5	203·46	187·39	220·20	201·42	236·40	214·76
One to 74	0 46 27	203·35	187·48	220·08	201·53	236·24	214·90
One to 75	0 45 50	203·23	187·58	219·94	201·64	236·08	215·03
One to 76	0 45 13	203·11	187·68	219·81	201·76	235·93	215·16
One to 77	0 44 40	203·00	187·77	219·68	201·86	235·78	215·28
One to 78	0 44 4	202·90	187·86	219·56	201·97	235·64	215·40
One to 79	0 43 30	202·79	187·95	219·44	202·07	235·50	215·52
One to 80	0 42 58	202·69	188·04	219·32	202·17	235·36	215·63
One to 81	0 42 26	202·59	188·12	219·21	202·26	235·23	215·74

TABLE V.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 3 to 1.		Slope of Work. 3½ to 1.		Slope of Work. 3¼ to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 82	0 41 55	202·50	188·20	219·11	202·36	235·10	215·85
One to 83	0 41 25	202·41	188·28	219·00	202·45	234·97	215·95
One to 84	0 40 55	202·32	188·36	218·88	202·54	234·85	216·06
One to 85	0 40 26	202·23	188·43	218·77	202·63	234·73	216·16
One to 86	0 39 58	202·14	188·51	218·67	202·72	234·61	216·26
One to 87	0 39 31	202·06	188·58	218·57	202·80	234·49	216·35
One to 88	0 39 3	201·97	188·66	218·47	202·89	234·38	216·45
One to 89	0 38 37	201·89	188·73	218·38	202·97	234·27	216·54
One to 90	0 38 11	201·82	188·79	218·30	203·05	234·16	216·64
One to 91	0 37 46	201·74	188·86	218·19	203·12	234·06	216·72
One to 92	0 37 22	201·67	188·93	218·11	203·20	233·96	216·81
One to 93	0 36 57	201·60	188·99	218·02	203·27	233·86	216·89
One to 94	0 36 34	201·52	189·05	217·94	203·35	233·77	216·98
One to 95	0 36 11	201·45	189·11	217·86	203·42	233·67	217·06
One to 96	0 35 48	201·38	189·17	217·78	203·49	233·57	217·14
One to 97	0 35 26	201·31	189·23	217·69	203·55	233·48	217·22
One to 98	0 35 4	201·24	189·29	217·62	203·61	233·39	217·30
One to 99	0 34 43	201·18	189·34	217·55	203·68	233·30	217·37
One to 100	0 34 23	201·12	189·40	217·48	203·74	233·22	217·44
One to 150	0 22 55	199·06	191·25	215·04	205·90	230·41	219·90
One to 300	0 11 27	197·04	193·14	212·67	208·11	227·69	222·44
Level ..	.. ..	195·00	195·00	210·00	210·00	225·00	225·00

TABLE VI.

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. $3\frac{3}{4}$ to 1.		Slope of Work. 4 to 1.		Slope of Work. $4\frac{1}{4}$ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 7	8	7	48	522·32	157·88	..	..	..	..
One to 8	7	7	30	455·40	164·69	..	..	..	..
One to 9	6	20	25	414·06	170·48	..	..	..	..
One to 9·6	5	56	48	396·06	173·54	..	..	..	..
One to 10	5	42	38	386·23	175·44	427·44	183·11	..	..
One to 11	5	11	40	365·72	179·74	402·66	187·83	..	..
One to 12	4	45	50	350·38	183·51	384·10	191·98	..	..
One to 12·706	4	30	00	341·61	185·90	373·56	194·61	..	..
One to 13	4	23	55	338·36	186·84	370·30	195·65	..	..
One to 14	4	5	8	328·70	189·80	358·14	198·91	388·57	207·61
One to 15	3	48	51	320·70	192·45	348·72	201·84	377·48	210·81
One to 16	3	34	35	314·08	194·83	340·87	204·47	368·28	213·70
One to 17	3	21	59	308·46	196·98	334·23	206·86	360·52	216·33
One to 18	3	10	47	303·64	198·95	328·55	209·04	353·90	218·72
One to 19	3	0	46	299·46	200·73	323·64	211·03	348·19	220·90
One to 20	2	51	44	295·80	202·38	319·33	212·85	343·19	222·92
One to 21	2	43	34	292·54	203·90	315·53	214·53	338·80	224·76
One to 22	2	36	9	289·65	205·29	312·16	216·08	334·75	226·47
One to 23	2	29	22	287·07	206·58	309·32	217·52	331·43	228·06
One to 24	2	23	9	284·73	207·78	306·43	218·85	328·30	229·53
One to 25	2	17	26	282·62	208·89	303·98	220·10	325·48	230·90
One to 26	2	12	9	280·70	209·93	301·75	221·25	322·91	232·19
One to 27	2	7	15	278·94	210·90	299·71	222·23	320·57	233·39
One to 28	2	2	43	277·33	211·82	297·85	223·36	318·44	234·57
One to 29	1	58	29	275·85	212·67	296·13	224·32	316·47	235·57
One to 30	1	54	33	274·48	213·48	294·55	225·22	314·66	236·58
One to 31	1	50	51	273·21	214·23	293·08	226·07	312·98	237·52
One to 32	1	47	23	272·02	214·96	291·72	226·87	311·42	238·41
One to 33	1	44	8	270·94	215·63	290·45	227·63	309·98	239·26
One to 34	1	41	5	269·91	216·28	289·27	228·35	308·63	240·05
One to 35	1	38	11	268·95	216·89	288·17	229·04	307·36	240·81
One to 36	1	35	28	268·05	217·47	287·16	229·68	306·18	241·53
One to 37	1	32	53	267·21	218·02	286·16	230·30	305·07	242·22
One to 38	1	30	26	266·41	218·54	285·24	230·90	304·03	242·87
One to 39	1	28	7	265·65	219·05	284·37	231·46	303·04	243·50

TABLE VI.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. 3¾ to 1.		Slope of Work. 4 to 1.		Slope of Work. 4¼ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 40	1	25	55	264·95	219·53	283·57	231·99	302·12	244·10
One to 41	1	23	49	264·26	219·99	282·79	232·50	301·23	244·66
One to 42	1	21	50	263·63	220·42	282·07	232·99	300·41	245·20
One to 43	1	19	56	263·03	220·84	281·39	233·45	299·62	245·72
One to 44	1	18	7	262·46	221·23	280·71	233·91	298·87	246·22
One to 45	1	16	23	261·90	221·63	280·10	234·33	298·17	246·69
One to 46	1	14	43	261·38	221·99	279·49	234·76	297·48	247·17
One to 47	1	13	7	260·89	222·35	278·93	235·15	296·85	247·60
One to 48	1	11	36	260·43	222·68	278·38	235·54	296·22	248·04
One to 49	1	10	9	259·96	223·02	277·87	235·90	295·64	248·44
One to 50	1	8	45	259·55	223·33	277·37	236·27	295·06	248·85
One to 51	1	7	23	259·11	223·64	276·90	236·60	294·53	249·22
One to 52	1	6	6	258·73	223·93	276·44	236·93	294·01	249·59
One to 53	1	4	51	258·34	224·22	276·01	237·24	293·52	249·94
One to 54	1	3	39	257·99	224·48	275·58	237·56	293·04	250·29
One to 55	1	2	29	257·64	224·75	275·18	237·86	292·59	250·61
One to 56	1	1	23	257·32	225·00	274·79	238·15	292·14	250·94
One to 57	1	0	18	256·99	225·25	274·42	238·47	291·73	251·24
One to 58	0	59	16	256·66	225·48	274·06	238·79	291·32	251·55
One to 59	0	58	15	256·32	225·72	273·72	238·99	290·93	251·84
One to 60	0	57	17	256·07	225·95	273·39	239·20	290·55	252·12
One to 61	0	56	21	255·82	226·16	273·07	239·44	290·19	252·44
One to 62	0	55	26	255·54	226·37	272·75	239·68	289·83	252·76
One to 63	0	54	33	255·26	226·58	272·47	239·91	289·50	252·96
One to 64	0	53	42	255·06	226·77	272·17	240·14	289·17	253·16
One to 65	0	52	53	254·84	226·96	271·90	240·35	288·87	253·40
One to 66	0	52	5	254·63	227·15	271·62	240·56	288·56	253·64
One to 67	0	51	18	254·36	227·32	271·36	240·76	288·25	253·87
One to 68	0	50	33	254·10	227·49	271·10	240·97	287·92	254·08
One to 69	0	49	49	253·85	227·68	270·86	241·16	287·69	254·29
One to 70	0	49	6	253·65	227·85	270·62	241·35	287·41	254·52
One to 71	0	48	24	253·46	228·00	270·38	241·53	287·15	254·72
One to 72	0	47	44	253·27	228·16	270·16	241·70	286·90	254·92
One to 73	0	47	5	253·07	228·31	269·94	241·87	286·65	255·10
One to 74	0	46	27	252·88	228·46	269·72	242·05	286·40	255·30

TABLE VI.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. $3\frac{3}{4}$ to 1.		Slope of Work. 4 to 1.		Slope of Work. $4\frac{1}{2}$ to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 75	0 45 50	252·69	228·62	269·52	242·21	286·17	255·48
One to 76	0 45 13	252·52	228·76	269·32	242·37	285·95	255·66
One to 77	0 44 40	252·35	228·90	269·12	242·54	285·73	255·84
One to 78	0 44 4	252·18	229·04	268·93	242·68	285·52	256·00
One to 79	0 43 30	252·02	229·17	268·75	242·83	285·31	256·17
One to 80	0 42 58	251·86	229·30	268·57	242·98	285·10	256·34
One to 81	0 42 26	251·70	229·43	268·40	243·12	284·92	256·49
One to 82	0 41 55	251·55	229·55	268·23	243·26	284·73	256·64
One to 83	0 41 25	251·41	229·67	268·06	243·40	284·54	256·79
One to 84	0 40 55	251·27	229·79	267·90	243·53	284·35	256·94
One to 85	0 40 26	251·12	229·90	267·74	243·66	284·16	257·10
One to 86	0 39 58	250·99	230·01	267·58	243·79	284·00	257·23
One to 87	0 39 31	250·86	230·12	267·43	243·91	283·83	257·36
One to 88	0 39 3	250·72	230·24	267·28	244·03	283·67	257·49
One to 89	0 38 37	250·60	230·34	267·14	244·15	283·50	257·63
One to 90	0 38 11	250·48	230·45	267·00	244·28	283·33	257·78
One to 91	0 37 46	250·36	230·55	266·87	244·39	283·19	257·90
One to 92	0 37 22	250·23	230·65	266·74	244·50	283·04	258·02
One to 93	0 36 57	250·12	230·75	266·61	244·61	282·89	258·14
One to 94	0 36 34	250·00	230·84	266·48	244·72	282·74	258·26
One to 95	0 36 11	249·88	230·93	266·35	244·82	282·59	258·39
One to 96	0 35 48	249·77	231·03	266·23	244·92	282·46	258·50
One to 97	0 35 26	249·66	231·11	266·12	245·02	282·33	258·61
One to 98	0 35 4	249·57	231·19	266·01	245·12	282·20	258·72
One to 99	0 34 43	249·46	231·28	265·89	245·22	282·07	258·83
One to 100	0 34 23	249·36	231·37	265·77	245·31	281·94	258·94
One to 150	0 22 55	246·20	234·18	262·12	248·50	277·81	262·50
One to 300	0 11 27	243·08	237·07	258·56	251·76	273·82	266·17
Level ..	.. ..	240·0	240·0	255·0	255·0	270·0	270·0

TABLE VII.

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. 4½ to 1.		Slope of Work. 4½ to 1.		Slope of Work. 5 to 1.	
				Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
				Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 14	4	5	8	421·16	216·25	455·21	224·57	491·25	232·70
One to 15	3	48	51	408·14	219·75	440·01	228·36	473·56	236·78
One to 16	3	34	35	397·39	222·90	427·51	231·78	459·08	240·47
One to 17	3	21	59	388·35	225·77	417·05	234·89	447·02	243·83
One to 18	3	10	47	380·66	228·38	408·18	237·73	436·82	246·90
One to 19	3	0	46	374·04	230·77	400·56	240·33	428·00	249·72
One to 20	2	51	44	368·27	232·98	393·93	242·73	420·52	252·32
One to 21	2	43	34	363·20	235·01	388·13	244·95	413·70	254·72
One to 22	2	36	9	358·73	236·88	383·02	246·99	408·07	256·93
One to 23	2	29	22	354·73	238·62	378·44	248·89	402·88	259·00
One to 24	2	23	9	351·14	240·24	374·35	250·66	398·23	260·92
One to 25	2	17	26	347·90	241·75	370·67	252·31	394·07	262·71
One to 26	2	12	9	344·97	243·17	367·33	253·85	390·29	264·39
One to 27	2	7	15	342·29	244·49	364·29	255·30	386·85	265·97
One to 28	2	2	43	339·85	245·73	361·52	256·66	383·72	267·45
One to 29	1	58	29	337·60	246·90	358·98	257·94	380·84	268·84
One to 30	1	54	33	335·54	248·00	356·64	259·14	378·16	270·15
One to 31	1	50	51	333·63	249·04	354·47	260·28	375·77	271·40
One to 32	1	47	23	331·85	250·02	352·46	261·36	373·51	272·57
One to 33	1	44	8	330·21	250·95	350·60	262·38	371·42	273·68
One to 34	1	41	5	328·68	251·83	349·88	263·34	369·47	274·73
One to 35	1	38	11	327·24	252·68	347·25	264·27	367·64	275·74
One to 36	1	35	28	325·90	253·47	345·74	265·14	365·95	276·70
One to 37	1	32	53	324·64	254·23	344·31	265·97	364·35	277·60
One to 38	1	30	26	323·45	254·95	342·98	266·77	362·85	278·38
One to 39	1	28	7	322·33	255·64	341·72	267·52	361·43	279·30
One to 40	1	25	55	321·28	256·30	340·53	268·25	360·11	280·09
One to 41	1	23	49	320·28	256·93	339·48	268·94	358·85	280·85
One to 42	1	21	50	319·35	257·53	338·36	269·60	357·67	281·57
One to 43	1	19	56	318·46	258·11	337·35	270·23	356·54	282·27
One to 44	1	18	7	317·60	258·66	336·40	270·84	355·48	282·93
One to 45	1	16	23	316·73	259·20	335·48	271·43	354·46	283·58
One to 46	1	14	43	316·03	259·70	334·63	271·99	353·50	284·19
One to 47	1	13	7	315·32	260·18	333·80	272·53	352·57	284·78
One to 48	1	11	36	314·60	260·67	333·02	273·05	351·70	285·35

TABLE VII.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 feet. Width of Road, 30 Feet.					
				Slope of Work. $4\frac{1}{2}$ to 1.		Slope of Work. $4\frac{1}{2}$ to 1.		Slope of Work. 5 to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 49	1	10	9	313·95	261·11	332·29	273·55	350·86	285·90
One to 50	1	8	45	313·30	261·56	331·56	274·04	350·06	286·43
One to 51	1	7	23	312·70	261·98	330·89	274·49	349·32	286·93
One to 52	1	6	6	312·11	262·39	330·22	274·95	348·58	287·42
One to 53	1	4	51	311·56	262·77	329·61	275·37	347·89	287·89
One to 54	1	3	39	311·01	263·16	328·99	275·80	347·20	288·36
One to 55	1	2	29	310·50	263·52	328·42	276·20	346·56	288·79
One to 56	1	1	23	310·00	263·89	327·86	276·60	345·93	289·23
One to 57	1	0	18	309·53	264·22	327·33	276·97	345·34	289·64
One to 58	0	59	16	309·07	264·56	326·80	277·34	344·76	290·05
One to 59	0	58	15	308·64	264·87	326·32	277·69	344·22	290·43
One to 60	0	57	17	308·20	265·19	325·84	278·04	343·68	290·81
One to 61	0	56	21	307·79	265·49	325·39	278·36	343·17	291·12
One to 62	0	55	26	307·39	265·79	324·94	278·69	342·67	291·44
One to 63	0	54	33	307·01	266·07	324·51	279·01	342·20	291·83
One to 64	0	53	42	306·64	266·35	324·09	279·32	341·73	292·22
One to 65	0	52	53	306·29	266·61	323·70	279·60	341·30	292·53
One to 66	0	52	5	305·94	266·88	323·31	279·89	340·86	292·85
One to 67	0	51	18	305·61	267·13	322·94	280·17	340·44	293·15
One to 68	0	50	33	305·29	267·38	322·57	280·45	340·03	293·46
One to 69	0	49	49	304·97	267·62	322·22	280·71	339·64	293·75
One to 70	0	49	6	304·68	267·85	321·88	280·97	339·26	294·03
One to 71	0	48	24	304·38	268·08	321·54	281·23	338·90	294·31
One to 72	0	47	44	304·08	268·30	321·23	281·46	338·54	294·58
One to 73	0	47	5	303·81	268·51	320·92	281·69	337·20	294·75
One to 74	0	46	27	303·54	268·72	320·61	281·94	337·86	294·93
One to 75	0	45	50	303·27	268·93	320·33	282·16	337·54	295·23
One to 76	0	45	13	303·02	269·12	320·04	282·38	337·22	295·53
One to 77	0	44	40	302·77	269·31	319·75	282·60	336·90	295·82
One to 78	0	44	4	302·52	269·52	319·48	282·80	336·61	296·05
One to 79	0	43	30	302·28	269·70	319·22	283·00	336·32	296·28
One to 80	0	42	58	302·06	269·88	318·96	283·21	336·03	296·50
One to 81	0	42	26	301·84	270·06	318·72	283·40	335·76	296·71
One to 82	0	41	55	301·62	270·23	318·48	283·59	335·49	296·92
One to 83	0	41	25	301·42	270·40	318·24	283·78	335·22	297·13

TABLE VII.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 4½ to 1.		Slope of Work. 4½ to 1.		Slope of Work. 5 to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 84	0 40 55	301·21	270·56	318·02	283·96	334·97	297·33
One to 85	0 40 26	301·01	270·73	317·79	284·14	334·72	297·52
One to 86	0 39 58	300·80	270·89	317·57	284·32	334·47	297·72
One to 87	0 39 31	300·62	271·04	317·34	284·50	334·23	297·90
One to 88	0 39 3	300·44	271·19	317·14	284·66	334·00	298·08
One to 89	0 38 37	300·25	271·34	316·94	284·82	333·77	298·26
One to 90	0 38 11	300·06	271·49	316·74	284·98	333·54	298·45
One to 91	0 37 46	299·88	271·63	316·54	285·14	333·30	298·61
One to 92	0 37 22	299·72	271·76	316·35	285·29	333·07	298·77
One to 93	0 36 57	299·56	271·90	316·17	285·44	332·84	298·94
One to 94	0 36 34	299·40	272·03	315·99	285·59	332·61	299·11
One to 95	0 36 11	299·24	272·17	315·81	285·74	332·46	299·26
One to 96	0 35 48	299·10	272·29	315·64	285·87	332·30	299·42
One to 97	0 35 26	298·95	272·41	315·47	286·00	332·14	299·58
One to 98	0 35 4	298·80	272·53	315·32	286·14	331·96	299·73
One to 99	0 34 43	298·65	272·65	315·15	286·27	331·78	299·87
One to 100	0 34 23	298·50	272·78	314·98	286·41	331·60	300·02
One to 150	0 22 55	293·86	276·75	309·82	290·80	325·87	304·85
One to 300	0 11 27	289·38	280·83	304·83	295·33	320·34	309·84
Level ..	.. ..	285·00	285·00	300·00	300·00	315·00	315·00

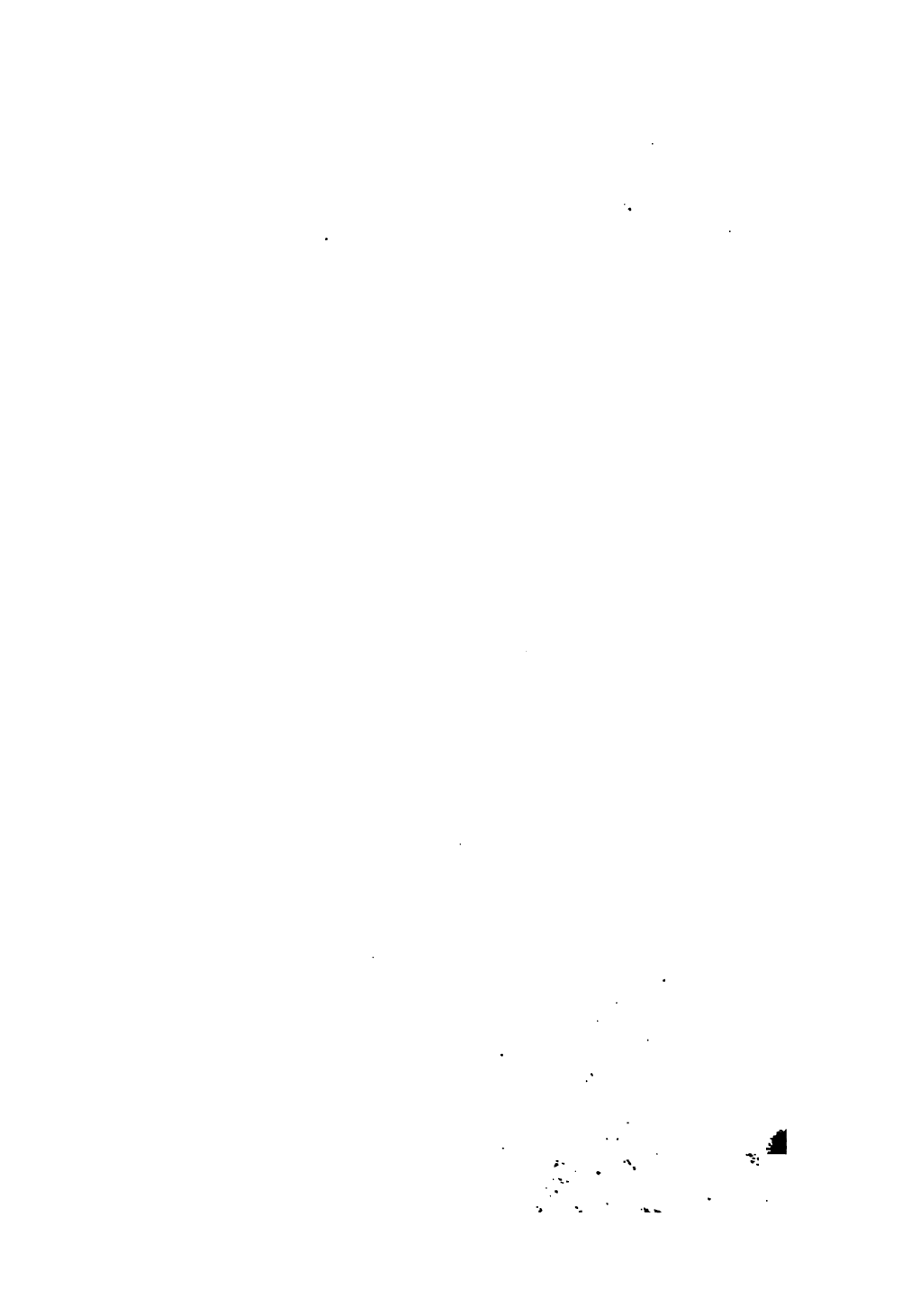
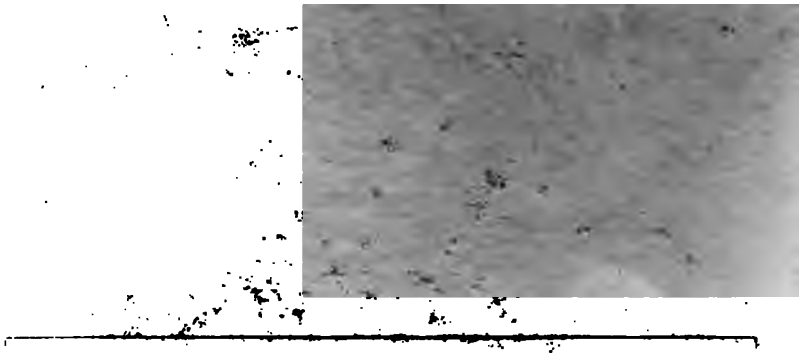
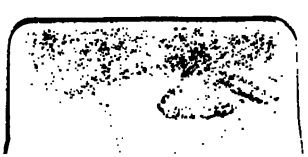
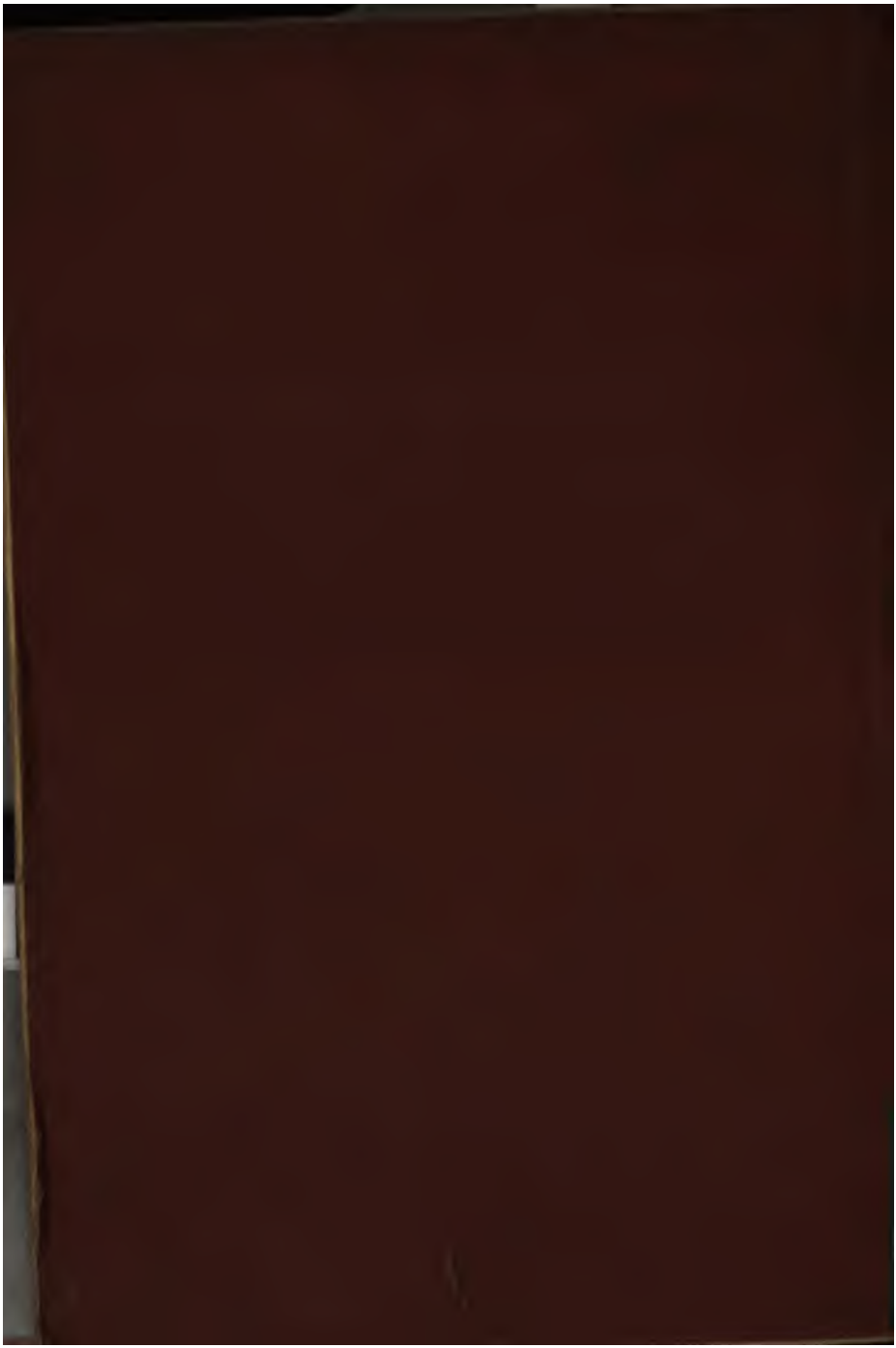
TABLE VIII.

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. 5¼ to 1.		Slope of Work. 5½ to 1.		Slope of Work. 5¾ to 1.	
				Embankment.		Embankment.		Embankment.	
				Lower.	Higher.	Lower.	Higher.	Lower.	Higher.
				Cutting.		Cutting.		Cutting.	
				Higher.	Lower.	Higher.	Lower.	Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 15	3	48	51	509·03	245·01	545·96	253·00	585·16	260·83
One to 16	3	34	35	492·27	248·98	526·75	257·25	563·10	265·36
One to 17	3	21	59	478·42	252·60	510·89	261·12	544·99	269·50
One to 18	3	10	47	466·73	255·91	497·57	264·66	529·84	273·29
One to 19	3	0	46	456·76	258·94	486·24	267·92	516·99	276·77
One to 20	2	51	44	448·13	261·75	476·45	270·93	505·93	279·98
One to 21	2	43	34	440·61	264·34	467·95	273·71	496·34	282·96
One to 22	2	36	9	433·99	266·73	460·48	276·29	487·93	285·72
One to 23	2	29	22	428·12	268·96	453·86	278·69	480·49	288·29
One to 24	2	23	9	422·87	271·04	447·96	280·93	473·87	290·69
One to 25	2	17	26	418·16	272·98	442·67	283·02	467·95	292·94
One to 26	2	12	9	413·90	274·80	437·89	284·98	462·60	295·04
One to 27	2	7	15	410·03	276·51	433·54	286·82	457·75	297·02
One to 28	2	2	43	406·51	278·11	429·60	288·55	453·36	298·88
One to 29	1	58	29	403·28	279·63	425·99	290·18	449·33	300·64
One to 30	1	54	33	400·32	281·05	422·69	291·72	445·65	302·29
One to 31	1	50	51	397·58	282·39	419·63	293·17	442·24	303·86
One to 32	1	47	23	395·04	283·67	416·80	294·55	439·10	305·30
One to 33	1	44	8	392·70	284·88	414·19	295·86	436·19	306·75
One to 34	1	41	5	390·54	286·02	411·76	297·09	433·50	308·08
One to 35	1	38	11	388·48	287·12	409·48	298·28	430·98	309·36
One to 36	1	35	28	386·58	288·15	407·38	299·40	428·63	310·56
One to 37	1	32	53	384·79	289·14	405·39	300·47	426·43	311·72
One to 38	1	30	26	383·11	290·09	403·52	301·49	424·36	312·82
One to 39	1	28	7	381·54	290·99	401·77	302·47	422·42	313·88
One to 40	1	25	55	380·05	291·85	400·12	303·40	420·60	314·88
One to 41	1	23	49	378·65	292·68	398·57	304·29	418·88	315·85
One to 42	1	21	50	377·33	293·46	397·10	305·14	417·26	316·77
One to 43	1	19	56	376·08	294·22	395·71	305·96	415·72	317·65
One to 44	1	18	7	374·89	294·97	394·39	306·75	414·26	318·50
One to 45	1	16	23	373·76	295·64	393·14	307·50	412·88	319·32
One to 46	1	14	43	372·68	296·31	391·95	308·23	411·56	320·10
One to 47	1	13	7	371·65	296·96	390·80	308·94	410·30	320·86
One to 48	1	11	36	370·68	297·58	389·73	309·61	409·11	321·59
One to 49	1	10	9	369·76	298·17	388·72	310·24	407·98	322·28

TABLE VIII.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.			Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
				Slope of Work. $5\frac{1}{2}$ to 4.		Slope of Work. $5\frac{1}{2}$ to 1.		Slope of Work. $5\frac{1}{2}$ to 1.	
				Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
				Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	°	′	″	feet.	feet.	feet.	feet.	feet.	feet.
One to 50	1	8	45	368·87	298·75	387·72	310·88	406·90	322·96
One to 51	1	7	23	368·01	299·29	386·80	311·47	405·85	323·62
One to 52	1	6	6	367·20	299·84	385·88	312·06	404·86	324·24
One to 53	1	4	51	366·44	300·35	385·02	312·63	403·93	324·84
One to 54	1	3	39	365·68	300·86	384·19	313·17	403·00	325·44
One to 55	1	2	29	364·97	301·34	383·41	313·68	402·14	326·00
One to 56	1	1	23	364·27	301·81	382·64	314·20	401·29	326·55
One to 57	1	0	18	363·62	302·25	381·91	314·68	400·48	327·09
One to 58	0	59	16	362·98	302·70	381·20	315·17	399·71	327·60
One to 59	0	58	15	362·37	303·12	380·53	315·62	398·96	328·10
One to 60	0	57	17	361·77	303·54	379·87	316·08	398·24	328·59
One to 61	0	56	21	361·20	303·94	379·26	316·50	397·56	329·05
One to 62	0	55	26	360·64	304·33	378·65	316·92	396·88	329·52
One to 63	0	54	33	360·12	304·70	378·04	317·35	396·24	329·95
One to 64	0	53	42	359·60	305·07	377·49	317·73	395·61	330·39
One to 65	0	52	53	359·12	305·42	376·95	318·11	395·02	330·80
One to 66	0	52	5	358·64	305·77	376·41	318·50	394·43	331·21
One to 67	0	51	18	358·18	306·10	375·92	318·86	393·88	331·60
One to 68	0	50	33	357·72	306·43	375·42	319·22	393·33	331·99
One to 69	0	49	49	357·29	306·74	374·92	319·57	392·80	332·36
One to 70	0	49	6	356·86	307·06	374·47	319·90	392·28	332·74
One to 71	0	48	24	356·46	307·36	374·02	320·23	391·81	333·09
One to 72	0	47	44	356·06	307·66	373·57	320·56	391·33	333·44
One to 73	0	47	5	355·68	307·94	373·16	320·86	390·85	333·78
One to 74	0	46	27	355·31	308·22	372·75	321·16	390·40	334·10
One to 75	0	45	50	354·94	308·49	372·34	321·46	389·96	334·42
One to 76	0	45	13	354·58	308·76	371·96	321·74	389·52	334·74
One to 77	0	44	40	354·24	309·01	371·58	322·02	389·11	335·04
One to 78	0	44	4	353·91	309·26	371·20	322·31	388·71	335·34
One to 79	0	43	30	353·59	309·52	370·86	322·57	388·31	335·64
One to 80	0	42	58	353·29	309·75	370·51	322·83	387·95	335·91
One to 81	0	42	26	352·98	309·98	370·16	323·09	387·58	336·18
One to 82	0	41	55	352·67	310·22	369·84	323·34	387·21	336·47
One to 83	0	41	25	352·39	310·44	369·52	323·59	386·87	336·73
One to 84	0	40	55	352·10	310·66	369·20	323·83	386·52	336·99

TABLE VIII.—*continued.*

Inclination of Natural Slope.	Angle of Natural Slope.	Depth of Cutting and Height of Embankment, 60 Feet. Width of Road, 30 Feet.					
		Slope of Work. 5½ to 1.		Slope of Work. 5⅔ to 1.		Slope of Work. 5¾ to 1.	
		Embankment. Lower.	Higher.	Embankment. Lower.	Higher.	Embankment. Lower.	Higher.
		Cutting. Higher.	Lower.	Cutting. Higher.	Lower.	Cutting. Higher.	Lower.
	° ′ ″	feet.	feet.	feet.	feet.	feet.	feet.
One to 85	0 40 26	351·81	310·88	368·90	324·06	386·17	337·24
One to 86	0 39 58	351·55	311·08	368·61	324·29	385·86	337·48
One to 87	0 39 31	351·29	311·28	368·31	324·52	385·55	337·72
One to 88	0 39 3	351·03	311·48	368·02	324·74	385·23	337·96
One to 89	0 38 37	350·77	311·69	367·76	324·94	384·91	338·20
One to 90	0 38 11	350·53	311·88	367·49	325·15	384·62	338·42
One to 91	0 37 46	350·30	312·07	367·22	325·36	384·33	338·64
One to 92	0 37 22	350·07	312·25	366·96	325·56	384·05	338·86
One to 93	0 36 57	349·83	312·44	366·71	325·75	383·77	339·09
One to 94	0 36 34	349·62	312·61	366·47	325·94	383·52	339·29
One to 95	0 36 11	349·41	312·78	366·23	326·13	383·26	339·49
One to 96	0 35 48	349·19	312·95	365·99	326·33	383·00	339·69
One to 97	0 35 26	348·97	313·13	365·77	326·51	382·74	339·90
One to 98	0 35 4	348·78	313·29	365·55	326·68	382·50	340·09
One to 99	0 34 43	348·58	313·45	365·33	326·85	382·26	340·28
One to 100	0 34 23	348·38	313·60	365·11	327·03	382·02	340·47
One to 150	0 22 55	342·04	318·90	358·14	332·81	374·39	346·75
One to 300	0 11 27	335·94	324·39	351·44	338·80	367·06	353·27
Level ..	.. ..	330·00	330·00	345·00	345·00	360·00	360·00

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